DOCUMENT RESUME

ED 335 894 FL 019 347

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TITLE WH-Questions and Extraction from Temporal Adjuncts: A Case for Movement.
PUB DATE Apr 89
NOTE 9p.; In: Papers and Reports on Child Language Development, Number 28, p123-130, Aug 1989. For the proceedings, see FL 019 336.
PUB TYPE Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Child Language; Grammar; *Language Acquisition; Language Research; Linguistic Theory; Preschool Children; *Sentence Structure; *Syntax
IDENTIFIERS *Wh Questions

ABSTRACT

A study investigated young children's knowledge of the constraint that prevents questioning from a position inside a temporal adjunct: i.e., knowledge of the ungrammaticality of a question such as "Who did Fred kiss Sue before hugging...?" Subjects were 30 children aged 3 to 5 years, who listened to stories accompanied by pictures and were asked potentially ambiguous questions in which the "wh-" word could be taken to refer to either the object of the main clause or the object of an embedded clause. Results indicate that children as young as 3 years old are aware of this "island" constraint, suggesting that they have movement in syntax and have, by this stage, formed a grammar similar to that of adults in one fundamental aspect. (MSE)

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WH-QUESTIONS AND EXTRACTION FROM TEMPORAL ADJUNCTS: A CASE FOR MOVEMENT

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This paper reports the results of an experiment testing children's knowledge of the constraint that prevents questioning from a position inside a temporal adjunct, i.e. knowledge of the ungrammaticality of questions such as,

1. *Who did Fred kiss Sue before hugging _?

We find that children as young as three years show awareness of the constraint. We interpret these results as evidence that children form questions in English by movement (by an operation linking deep structure to surface structure).

I. Islands and movement

Languages are widely agreed to differ in whether they have movement "in the syntax", linking deep and surface structures. A standard diagnostic of a language with movement in the syntax is obedience to structural constraints. Languages which form questions and other sentence types by dislocating an element from its underlying position tend to obey "island" conditions, limiting the positions from which an element may be moved. The block on movement from within a temporal clause is one such structural condition. Languages such as English, which form questions by dislocating the question word to the front of the sentence obey the constraint exemplified in (1); languages such as Chinese and Japanese, which do not form questions by dislocation of a question word, allow questions (including the equivalent of (1)) that are ungrammatical in English-type languages. (For pertinent discussion, see, for example, Huang 1982). We chose the temporal island to extraction as a focus of our test because it appears to be a very good indicator of language type. That is, unlike some other islands (for example complex NPs), it seems to be relatively immune to exceptions -- languages which form questions by dislocation of elements from their underlying position obey the constraint, those that do not form questions in that way allow questions equivalent to (1). The temporal island constraint is also explicable in terms of more general principles of grammar that putatively govern movement rules (specifically, subjacency), although this is not unproblematic (for recent discussion, see Chomsky 1986; Lightfoot and Weinberg, 1988).

II. The experiment[1]

II.1 Materials, subjects and procedure

Our experiment uses a picture-cued question-response task of the kind used by deVilliers, Roeper and Vainikka (1988). The child listens to

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"stories" about animals; each story consists of a sequence of four sentences, each accompanied by a picture. While looking at the last picture the child is asked a potentially ambiguous question, designed to probe his knowledge of syntactic conditions on movement.

There are three conditions in the experiment, with three stories for each condition. A sample story from each condition is given in (2A-C).[2]

2. A -- Temporal adjunct island
   Story: The fox ran down to the river
   First he ate an ice-cream cone
   Then he whistled a tune he'd heard on the radio
   The fox felt pretty happy.
   Question: What did the fox eat before whistling?
   Potential answers -- Upstairs: icecream
   -- Downstairs: a tune

   B -- ask plus complement in the verb phrase
   Story: The zebra was feeling happy
   He just wanted to hug and kiss everyone
   The zebra asked the lion: "Shall we kiss the monkey?"
   The zebra was a kind animal
   Question: Who did the zebra ask to kiss?
   Potential answers -- Upstairs: the lion
   -- Downstairs: the monkey

   C -- ask plus temporal adjunct island
   Story: The elephant liked to work
   She asked the tiger: "Shall I help the horse carry those boxes?"
   The tiger said "Yes!", so the elephant helped the horse.
   The elephant was tired at the end of it all.
   Question: Who did the elephant ask before helping?
   Potential Answers -- Upstairs: the tiger
   -- Downstairs: the horse

For all three conditions (A-C), the verbs in both the main and subordinate clause are optionally transitive. As a result each question has two logically possible answers - an "upstairs" answer, where the question word is taken to refer to the object position of the main clause, and a "downstairs" answer, where the question word is taken to refer to the object position of the embedded clause. In conditions A and C, where the embedded clause is a temporal adjunct, only the upstairs option is permitted in the adult grammar of English.[3] In condition B, where the embedded clause is a complement to the main clause verb phrase, the question is genuinely ambiguous in the adult grammar, and either upstairs or downstairs answers are permitted.[4]

Our test of knowledge of the temporal island condition involves

evaluating children's performance across the three conditions. Under the temporal island condition, we expect only upstairs answers to conditions A and C. Condition B gives us a control that preference for upstairs answers to conditions A and C is not simply a reflex of a preference for making the question word refer to a position inside a main as opposed to subordinate clause. In combination, conditions A, B and C give us some measure of the generality of the constraint--i.e whether or not apparent obedience to the constraint can be explained in terms of lexical preferences (preferences for particular verbs being construed as transitive). The adjunct island conditions A and C vary the type of predicates involved (two action verbs such as eat for A and one action verb and the verb ask for C). Since the same predicate types were used in both B and C, any difference in amount of downstairs answers for B vs. C is unlikely to be due to lexical preferences concerning whether particular verbs are transitive.[5] As an additional control against lexically-dependent results, half the subjects received materials with temporal adjuncts introduced by the preposition before and half received materials with the preposition after; thus for half the subjects the probe questions for the examples of conditions A and C were as given in (2) and for the other half the questions were, respectively, "What did the fox whistle after eating?" and "Who did the elephant help after asking?").

Thirty 3-5 year old children were tested (10 threes, 10 fours and 10 fives). The pictures for each story were bound in a 8 1/2 x 11 1/2 inch folder; the experimenter (JS) turned the pages of the folder for the child as she read the story to the child. The folders were shuffled to produce an individual order of presentation for each child, with the constraint that no runs of more than two stories in any condition were permitted. If a child did not respond on first presentation of the story, the folder was returned to at the end of the experiment for a second (and, if necessary, third) trial. Sessions were tape-recorded.

II.2 Results

Table 1 gives the results of the experiment in terms of the percentage upstairs, downstairs and "other" responses for the three conditions, by age group. We accepted as upstairs or downstairs answers responses that were not completely faithful to the content of the story, but which were plausibly an answer to one but not the other of the two predicates in the question (for example, the answer "a song" would be scored as a downstairs answer to the question for the story in 2A). In all, there were 26 non-exact answers of this type (9.5% of the total data, including failures to respond) that we accepted as upstairs or downstairs answers.

The percentage figures for conditions A and C (Table 1) show that by age five years children are very clear-cut in their obedience to the temporal island constraint; moreover, the results for condition B indicate that this is not simply the result of a preference for extraction from the main clause. The results for the three and four year olds are less clear-cut, but nonetheless show the same pattern as that for five year olds. As the figures in Table 1 show, the main development over age was for Other

responses to be replaced by upstairs responses, for all three conditions. There was a significant main effect of age for upstairs answers ($F(2,27)=9.65$, $p < .001$) but not for downstairs answers ($F(2,27)=1.72$, $p < .20$). Whether the child received materials with the preposition before or after had no significant effect of proportion of correct (upstairs) responses for either condition A or C (there was a very small trend in favor of more correct responses with before).

TABLE 1
Percentage Responses
by Age

	Condition A			Condition B			Condition C		
	U	D	OT	U	D	OT	U	D	OT
3 yrs	50	13	36	37	43	20	47	20	33
4 yrs	60	7	33	23	53	23	70	7	23
5 yrs	90	3	7	53	40	7	100	0	0

U = Upstairs; D = Downstairs; OT = Other

Table 2 summarizes the distribution of children in terms of individual response patterns over the three conditions. We took as criterion for knowledge of the constraint a response pattern with a least one downstairs response for condition B and both a greater number of upstairs responses for condition A than for condition B and a greater number of upstairs responses for condition C than for condition B. Of the 20 possible patterns of responses that were "pass" patterns by our criterion, 13 were exemplified among the 19 children who met criterion.

Table 2
Number of Children with
"Pass" Response Patterns

3 years	4
4 years	7
5 years	8

We wish to argue that our results indicate that by age three years children obey the adjunct island condition. By the logic that takes obedience to the constraint as a diagnostic of movement in the syntax, children at this age are forming questions by a movement operation of the same type as that in the adult grammar of English.[6]

III. Discussion

The development of movement rules has recently become a hot topic in language acquisition studies. A series of questions and proposals have come out of the literature of the last three or four years, including:

1. At a young age (say, before four years) children learning English-type languages may lack movement (Roeper 1986; deVilliers, Roeper and Vainikka 1988).

2. Within languages with movement as an operation between deep structure and surface structure, movement may develop at a different pace in different languages and different constructions (Weissenborn 1988; Labelle 1988; Goodluck and Behne 1988; Wexler 1988, 1989).

3. Constraints on movement may be violated (Wilson and Peters 1988).

We will not attempt to discuss all of this literature, but we need to address a basic question. We have argued that children as young as three obey the temporal adjunct island constraint and from that we have concluded that children at that age have established movement between deep structure and surface structure as an operation in their grammars. How can this be reconciled with the claims above, particularly claim (1) (that children may lack movement) and claim (3) (constraints may be violated)?

Roeper's (1986) claim that children may lack movement was based on the fact that some children aged 5-7 interpreted who and the pronoun he as coreferential in an experiment that tested strong cross-over sentences such as,

3. *Who$_i$ does he$_i$ think has a hat?

The ungrammaticality of such sentences (on the coreferential reading) is generally taken to result from a violation of principle C of Chomsky's binding theory (see Lasnik and Uriagereka, 1988 for summary and discussion); that is, from the ungrammaticality of binding the trace of wh$_i$ with the NP he. If children do not have movement, and hence do not have traces, sentences such as (3), might be permitted without any violation of grammatical principles; Roeper proposes that an unpronounced pronominal element (pro) may occupy the position of trace in the child's grammar.

We do not have any neat solution to Roeper's data, but we believe the weight of the evidence supports movement (and traces/bound variables). In addition to our results, in one experiment Roeper found that children who gave answers in violation of the cross-over constraint also gave multiple answers to questions such as (3), an interpretation that (as Roeper notes) will surely require a variable in the linguistic representation. Possibly the errors made by the children in Roeper's experiments were some kind of performance error. (C. McKee informs us of pilot data from an experiment she is conducting with D. McDaniel that suggests children's errors with strong cross-over are performance-based).[7,8]

Wilson and Peters 1988 report the case of a three year old child who went though a period of moving a noun to the front of the sentence, stranding in some cases determiner material (4a), and in others leaving part of a compound word behind (4b),

4.a What did I get lost at the, Dad?
(cf. I got lost at the store)

b What are you cooking pan?
(cf. You are cooking pancakes)

Taking island constraints as diagnostic of movement, these examples are not in fact evidence against movement, but evidence of an incorrrect conception of what gets moved. As Wilson and Peters observe, errors such

as those in (4) will result if the child is not aware that maximal projections, rather than heads, are what move. This does not, however, really lessen the oddity of the errors in (4). It is tempting to draw comparison with various types of incorporation processes in many languages, whereby nouns may be incorporated into verbs, stranding determiners, etc. (see Baker 1988 and references therein for many examples). However, the analogy is no more than an analogy. Incorporation is a lowering/morphological operation. The movement in (4) involves raising, presumably into Comp; no English-type languages we know of permit such questions and possibly such questions are ungrammatical in any language.[9]

IV. Summary and conclusion

By the test of obedience to an island constraint, we have argued that children learning English have movement in the syntax as early as three years. Thus children aged three have formed a grammar that is similar in a fundamental way to the adult grammar they are exposed to. This does not mean that they have nothing left to learn. Data such as Wilson and Peters' presents an interesting challenge for a common assumption in language acquisition studies -- that is, that the child's developing grammar should always fall within the range of language systems exemplified in adult grammars. Children should not have "rogue grammars", to borrow a term from Finer (1989). Whether such a constraint on child grammars can be sustained in its strongest form in the face of data such as Wilson and Peters' seems to us an interesting question to pursue.

Acknowledgements

This work was supported in part by funds from the Graduate Research Committee of the University of Ottawa. A pilot for the experiment was presented at the Annual Boston University Language Development Conference, October 1988. We are grateful to M.-L. Rivero for helpful discussions.

Footnotes

1. Ours is not the first attempt to establish children's sensitivity to islands, particularly subjacency. Several studies have looked at children's sensitivity to constraints on extraction from NPs, with results that are largely ambiguous or indeterminate (see Otsu 1981; Crain and Fodor 1984; Goodluck, to appear). Perhaps this reflects the fact that the constraints tested in those studies are subject to a degree of cross-linguistic and even individual-speaker variation even within languages with movement. Such variation suggests that the superficial form of the constructions involved may be amenable to more than one analysis, and thus present a special challenge for the learner who has to figure out which is the correct analysis for the language/dialect s/he is learning.

2. A complete set of materials is available on request.

3. The temporal complement structure in our materials is ambiguous between a verbal and nominal gerund structure. This ambiguity does not

affect the basic point we make concerning islands and movement, although the details of structure that the children are reacting to remains to a degree indeterminate in a way that may have substantial consequences for understanding other areas of development (see Wexler 1989).

4. In fact, condition B contained two stories with the matrix verb ask and one with the matrix verb want. Thus upstairs answers for one token in the condition involved extraction from subordinate subject position, rather than matrix object position. We included one token with want since we were initially not confident that ask would produce enough lower object extractions to provide the control we needed (see below); deVilliers, Roeper and Vainikka (1988) report 70% of responses to questions exactly of the form in 2B involved taking the question word as main clause object. We obtain a somewhat higher proportion of lower-object interpretations with condition B (see below). Each token contributed to the total lower object extractions, with one token with ask contributing somewhat less than the other token with ask or that with want.

5. We were particularly concerned that in conditions A/C children might jump at the main clause object position as a location for the wh-word, without listening to the whole question (i.e. they would plug the wh-word in as object of the main clause as soon as the matrix verb had been input). Literature on sentence processing from Fodor (1978) onwards argues that this is a real possibility and it may be the source of some correct answers for conditions A/C, although it plainly cannot account for any difference we find between B and C. One response was categorised as "Other" because the child clearly jumped the gun and responded before the experimenter had finished the question.

6. We leave open here whether those errors that do occur for Conditions A and C can be dismissed as performance errors; an error on these conditions is always compatible with a recency effect (responding to the last-mentioned predicate in the test question). We included a follow-up question to condition C, to test whether errors correlated with generally poorer recall of the story. Due to administrative error, we do not have complete data for the follow-up and can draw no firm conclusions from it.

7. In a longer version of this paper (ms. April 1989) we sketch a combined competence/performance account of such errors.

8. DeVilliers, Roeper and Vainikka (1988) discuss other data in the context of a no-movement account of early grammars. For reasons of space we will not discuss their arguments here, although we believe their data is accountable for under a grammar with movement. Roeper and deVilliers (1989) present some data on extraction from small clause vs. nominalization structures for 4-6 year olds that they suggest is evidence for movement.

9. A less radical analogy might be between movement of N and V raising, as in some analyses of the verbal system of French and other languages (for example, Pollock, 1987).

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